



CAIT

Center for Advanced Infrastructure & Transportation
Rutgers, The State University of New Jersey

QUARTERLY PROGRESS REPORT

Project Title:	Field Implementation of Geopolymer Coating		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: Robert Sasor		
TASK ORDER NUMBER/Study Number: 94 / 4-23951	PRINCIPAL INVESTIGATOR: P. Balaguru		
Study Start Date: 07/27/2000 Study End Date: 07/27/2002	Period Covered: 3 rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
1. Surface Preparation and Application Procedure	15%	20%	100%	15.0%
2. Temperature Limits and Protection Needed	15%	20%	100%	15.0%
3. Field Demonstration	35%	40%	100%	35%
4. Cost Estimate	5%	5%	100%	5%
5. Monitoring Field Performance & Cleaning Graffiti	20%	75%	100%	20%
6. Manual for Application Procedure	10%	100%	100%	10%
Final Report	%	0%	0%	0%
TOTAL	100%			100%

1. Progress this quarter by task:
Monitoring the coating in Rutgers and Rt 18.
2. Proposed activities for next quarter by task
Prepare cost estimate and application procedures.
3. List of deliverables provided in this quarter by task (product date)
N/A
4. Progress on Implementation and Training Activities
N/A
5. Problems/Proposed Solutions
N/A
6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$54,235.00
Total Project Expenditure to date		\$49,560
% of Total Project Budget Expended		91%
Task Order Number/Study Number:		94 / 4-23951
Current Task Order Budget (# of years)	Year 1 and 2	\$54,235.00
Actual Expenditure to date against current task order		\$49,560
% of current task order budget expended		91%

* These are approximate expended amounts for the project; these estimates are for reference only and should not be used for official accounting purposes. For a more accurate project accounting please review the quarterly invoice for this project.

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QUARTERLY PROGRESS REPORT

Project Title:	Noise Education Outreach Program		
RFP NUMBER:			NJDOT RESEARCH PROJECT MANAGER: Dominick Billera
TASK ORDER NUMBER/Study Number: 109 / 4-26710	PRINCIPAL INVESTIGATOR: Patrick Szary		
Study Start Date: 04/19/2001 Study End Date: 04/18/2003	Period Covered: 3 rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search	10	0	98	9.8
Development of CD-ROM	47	0	100	47
Information Clearinghouse	17	0	5	0.9
Education	21	0	15	3.15
Record Keeping & Reporting	5	0	0	0
TOTAL	100			28.4

1. Progress this quarter by task:

- a) Work on this project has been temporarily suspended pending NJDOT approval of the CD-ROM script, and substantive direction from the NJDOT on all other pending matters.

2. Proposed activities for next quarter by task, assuming NJDOT approval of CD-ROM script:

- a) Complete production of CD Gold version, enter into production.
- b) Presentation on Literature Search results for NJDOT. NJDOT will be presented with the "End Notes" searchable database including a bound hardcopy and an electronic copy of the database file. A copy of "End Notes" software will be purchased for NJDOT use in-house.
- c) Copy entire literature search results for housing at CAIT to fulfill distribution requests. CAIT will be presented with the "End Notes" searchable database. A copy of "End Notes" software will be purchased for CAIT use in-house.
- d) Still pending NJDOT approval, we will develop "fact sheets" to augment the information presented in the CD and the educational seminars. The issues covered are: planning and zoning for municipal officials, and architectural acoustics for building professionals. These will be distributed by CAIT, as the CD directs people to contact CAIT for further information.
- e) Now that the finalized CD-ROM script has been approved, we can complete the course outline, and continue with development of comprehensive course content. Possible completion of course development and presentation to NJDOT.
- f) Development of customer databases will be initiated for the project.
- g) Develop a mini-workshop for NJDOT.
- h) Hold workshops in various location throughout the state.
- i) Archive materials in library.
- j) Prepare CD for distribution.

3. List of deliverables provided in this quarter by task (product date)

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N.A.

4. Progress on Implementation and Training Activities

N.A.

5. Problems/Proposed Solutions

Problem: The NJDOT has not yet approved the concept or production of “Fact Sheets” to be distributed when there are requests for additional information. An implementation plan needs to be drafted.

Solution: The NJDOT must address this question forthrightly. No significant effort will be expended on the Fact Sheets until explicit approval is received.

6. Budget Summary*

Total Project Budget (# of years)	1 and 2 Year	\$ 347,853.00
Total Project Expenditure to date		\$178,999
% of Total Project Budget Expended		52%
Task Order Number/Study Number:		109 / 4-26710
Current Task Order Budget (# of years)	Year 1 and 2	\$ 347,853.00
Actual Expenditure to date against current task order		\$178,999
% of current task order budget expended		52%

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QUARTERLY PROGRESS REPORT

Project Title:	New Jersey State LTAP Technology Transfer Center		
RFP NUMBER:		NJDOT RESEARCH PROJECT MANAGER: Nicholas Vitillo	
TASK ORDER NUMBER/Study Number: 118 / 4-26909-4-26918		PRINCIPAL INVESTIGATOR: Dr. Ali Maher	
Study Start Date: 01/01/2002 Study End Date: 12/31/2002		Period Covered: 3rd Quarter 2002	

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Activity				
1. Compile and Maintain Mail List	2.95	0%	72%	2.1
2. Publish Monthly Newsletter	17.67	5%	69%	12.2
3. Distribute Technology Transfer Materials	19.51	6.5%	57%	11.1
4. Provide Technical Assistance	18.89	10%	74%	14.0
5. Provide Training	35.58	10%	68%	24.2
6. Evaluate Effectiveness of Program	5.41	0%	62%	3.4
Final Report				
TOTAL	100			67

1. Progress this quarter by task:

a. Compile and Maintain Mail List

The mail list has been updated as needed. Approximately 600 contacts for municipal, county, and public/private water authorities were updated during this quarter.

b. Publish Monthly Newsletter

Three newsletters were published this quarter.

Volume 4, Number 7 was published in July 2002. This issue featured articles announcing the Center for Advanced Infrastructure and Transportation's award of United States Department of Transportation grant funding, and iWalk brief, and a roadway safety questionnaire. In addition, course schedules, upcoming events, and a Free for the Asking offering were included. A new emergency management fact sheet produced by the American Public Works Association was also highlighted.



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Volume 4, Number 8 was published in August 2002. This issue contained information on the upcoming Municipal Emergency Management Preparedness Seminar, the 2002 League of Municipalities Conference, Free for the Asking offering, the Fall 2002 Road Scholar continuing education course schedule and a segment on Pro Bike/ Pro Walk 2002, as well as upcoming events.

Volume 4, Number 9 was published in September 2002. The third issue of the quarter included the survey results analysis of the Roadway Safety Questionnaire, a legislative transportation update, upcoming events and course schedule, and announcement of the 2nd Annual Technology Transfer Research Showcase. A Free for the Asking offering was also included.

c. Distribute Technology Transfer Materials

Technology transfer materials were distributed during training seminars, workshops, and free for the asking requests. Course materials, work zone safety pocket guides, technical publications, and reference materials from the lending library were made available. 6,981 individuals received each issue of the newsletter. In addition, 537 technical publications and manuals were distributed this quarter.

d. Provide Technical Assistance

There were 409 instances of technical assistance provided by LTAP staff. Requests were made via telephone, mail, e-mail, and fax.

e. Provide Training

Training was provided to 200 individuals via 9 programs during the July-September quarter. Program areas were composed of Traffic Control Coordinator, Road Scholar I, Road Scholar II, and a Municipal Emergency Management Preparedness Conference.

f. Evaluate Effectiveness of Program

Program effectiveness was measured by course evaluations for each course and each instructor. Participants rated the over all quality of courses, instructors, and course content at or above their expectations.

2. Proposed activities for next quarter by task

a. Compile and Maintain Mail List

Contact information will continue to be added to, and revised, on a continual basis.

b. Publish Monthly Newsletter

Newsletters will be published monthly as resources allow.



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- c. **Distribute Technology Transfer Materials**
Technology transfer materials will be distributed in training programs, at conferences and trade shows, and "Free for the Asking" component of the newsletter will continue to offer select technical publications free of charge. The lending library is always available.
- d. **Provide Technical Assistance**
Technical assistance will be provided for any inquiries made via telephone, fax, or e-mail to the LTAP staff.
- e. **Provide Training**
Training programs for the next quarter will be provided for the Public Works Road Scholar I and Public Works Road Scholar II programs, and a Technology Transfer Research Symposium.
- f. **Evaluate Effectiveness of Program**
Course evaluations will be completed at each training program for each instructor.

3. List of deliverables provided in this quarter by task (product date)

Newsletter:

Volume 4, Number 7	July 2002
Volume 4, Number 8	August 2002
Volume 4, Number 9	September 2002

Training Programs:

Superpave	September 12, 2002
Traffic Control Coordinator	September 17-20, 2002
Winter Maintenance	September 18, 2002
Preventive Maintenance	September 18, 2002
Municipal Emergency Management Preparedness Seminar	September 19, 2002
Drainage Maintenance: The Key to Roads that Last	September 24, 2002
Asphalt Roads: Common Maintenance Problems	September 24, 2002
Confined Space and Excavation Rescue	September 25, 2002
Trenching and Excavation Safety	September 25, 2002

4. Progress on Implementation and Training Activities

N.A.

5. Problems/Proposed Solutions

N.A.

6. Budget Summary*

Total Project Budget(# of years)	\$175,000
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Total Project Expenditure to date	61%
% of Total Project Budget Expended	\$106,750
Task Order Number/Study Number:	118
Current Task Order Budget (# of years)	\$175,000
Actual Expenditure to date against current task order	61%
% of current task order budget expended	\$106,750

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QUARTERLY PROGRESS REPORT

Project Title:	Material Characterization and Seasonal Variation in Material Properties		
RFP NUMBER:		NJDOT RESEARCH PROJECT MANAGER: Mr. Tony Chmiel	
TASK ORDER NUMBER/Study Number: Task Order No. 100 / 4-26701		PRINCIPAL INVESTIGATOR: Dr. Nenad Gucunski	
Study Start Date: 01/01/2001 Study End Date: 12/31/2003		Period Covered: 3rd Quarter 2002	

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Selection of Test Sections	5	100	100	5
Field Testing & Instrumentation	50	10	45	22.5
Analysis	35	10	3.5	7.0
Reporting	10	10	30	3
TOTAL	100%			37.5

1. Progress this quarter by task:
 - Seven cycles of FWD/SPA testing for the non-LTPP sites are completed.
 - Six cycles of FWD/SPA testing for LTPP sites are completed.
 - Environmental data was downloaded eight times since the instrumentation installed.
 - A site visit was done to all non-LTPP and LTPP sites to check on the instrumentation
 - Quality checks were performed on the collected environmental data.
 - Analysis on a part of the FWD/SPA data was performed
 - Laboratory evaluation of recovered AC cores and soil base materials in progress.
2. Proposed activities for next quarter by task:
 - Continue the regular FWD/SPA testing for the non-LTPP sites.
 - Continue the regular FWD/SPA testing on the LTPP sites.
 - Continue analysis on the FWD and SPA data.
 - Continue with laboratory evaluation of recovered AC cores and soil samples.
3. List of deliverables provided in this quarter by task (product date)
N/A
4. Progress on Implementation and Training Activities
N/A

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5. Problems/Proposed Solutions

N/A

6. Budget Summary*

Total Project Budget(# of years)	3 Years	\$1,695,894.00
Total Project Expenditure to date		\$715,902
% of Total Project Budget Expended		42%
Task Order Number/Study Number:		100 / 4-26701
Current Task Order Budget (# of years)	Year 1, 2, and 3	\$1,695,894.00
Actual Expenditure to date against current task order		\$715,902
% of current task order budget expended		42%

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QUARTERLY PROGRESS REPORT

Project Title:	Implementation of Weigh-In-Motion (WIM) Systems		
RFP NUMBER:		NJDOT RESEARCH PROJECT MANAGER: Nick Vitillo	
TASK ORDER NUMBER/Study Number: 92 / 4-23941		PRINCIPAL INVESTIGATOR: Dr. Ali Maher	
Study Start Date: 06/14/2000 Study End Date: 09/03/2002		Period Covered: 3 rd Quarter 2002	

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search	10%	20%	100%	10%
1. Packaging	17%	15%	95%	16.2%
2. Testing	14%	25%	85%	11.9%
3. Site Determination	11%	20%	60%	6.6%
4. Field Implementation & Calibration	16%	14%	42%	6.7%
5. Monitoring and Analysis	22%	0%	0%	0%
Final Report	10%	0%	0%	0%
TOTAL	100%			51.4%

1. Progress this quarter by task:

- A. We have been working on improving the compactness of our sensor model. First, we have wrapped sensor with Teflon tape, so the wires are as close as possible to the sensor. This has been done to provide smaller volume of the sensor. Second, we expanded the width and the depth of the pre-encapsulation mold. The dimensions are now 1.5"× 1". This was needed because to ensure complete encapsulation of the sensor. Third, the wires were reinforced with shrinking tube on the place where are they exiting from the pre-encapsulating bar. This has been done to prevent wire damage on the sensitive place and because the wires could not be repaired there and the sensor would be wasted.
- B. We worked with Nick Vitillo to determine the resolution of our sensor for wheel path analysis. This resolution is important because we want to track how stress is distributed horizontally across a segment of pavement. Later, this information could No significant changes have been registered.
- C. We are finalizing things to start field-testing. First site will probably be somewhere on campus. It will be done with two 3-foot sensors. Those two 3 foot sensors are already be very useful in designing pavements. The decision was that it would be eight sensors in one. One and a half feet long on the sides and four sensors of half a feet long in the middle. All together six feet.
- D. We were been using LabView model and BSI computer to test the effect of wrapping the sensor with Teflon tape and to determine the effect of pre-encapsulation. These sensors are made and they have been tested in the lab and they performed well. These testing was performed by BSI. We have checked if the sensors were build correctly and that there was not any short circuit. Also, we have checked if the initial signal was on the level as before pre-encapsulation.
- E. We are also working with Dr. Gucunski and Dr.Zaghouli to install the sensor in the field, since they were doing testing regarding WIM technology so their opinion and experience would be very useful for us.

2. Proposed activities for next quarter by task

- A. We will start with the field-testing of the sensor.

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- B. We will continue working with various NJDOT personnel to get their input into the study. It is our intention to develop a sensor that can be utilized by the NJDOT. We would like to get as much data from personnel that have experience with this type of sensor and utilize their experiences to help customize the sensor functionality.

3. List of deliverables provided in this quarter by task (product date)

N/A

4. Progress on Implementation and Training Activities

- A. Packaging of the sensor has almost been completed. The packaging has been one of the biggest problems, because the sensor has to give enough protection and stiffness yet still enough flexible not to have impact on the output.

5. Problems/Proposed Solutions

- A. Calibration of the sensor will be difficult. The voltages produced by the sensor will be measured accurately but what exactly that voltage means cannot be determined until a field calibration is calculated. The best thing would be to install our sensor near the static scale inside the weigh station, so we have good reference to our readings.
- B. The problem could be the small air pockets that are left between sensor and wires while wrapping it with Teflon tape. These air voids could possibly have impact on readings.

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$194,500.00
Total Project Expenditure to date		\$102,295
% of Total Project Budget Expended		53%
Task Order Number/Study Number:		92 / 4-23941
Current Task Order Budget (# of years)	Year 1 and 2	\$194,500.00
Actual Expenditure to date against current task order		\$102,295
% of current task order budget expended		53%

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QUARTERLY PROGRESS REPORT

Project Title:	Development of Airport Obstruction Identification System		
RFP NUMBER:		NJDOT RESEARCH PROJECT MANAGER: Ken Stevenson	
TASK ORDER NUMBER/Study Number: 115 / 4-26857		PRINCIPAL INVESTIGATOR: Patrick Szary	
Study Start Date: 01/1/2002 Study End Date: 12/31/2003		Period Covered: 3 rd Quarter 2002	

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
1. Literature Search	10%	0%	100%	10%
2. Develop criteria	5%	0%	100%	5%
3. Evaluate the cost effectiveness	8%	12.5%	87.5%	7%
4. Conduct laboratory experiments	5%	25%	25%	1.25%
5. Conduct laboratory/field experiments	15%	17%	50%	7.5%
6. Develop prototype software	25%	25%	25%	6.25%
7. Demonstrate field test system	5%	0%	0%	0%
8. Redesign a new prototype	5%	0%	0%	0%
9. Demonstrate prototype system	5%	0%	0%	0%
10. Train NJDOT personnel	7%	0%	0%	0%
11. Final Report	10%	0%	0%	0%
TOTAL	100%			37%

1. Progress this quarter by task:

- A. Images that were collected from the field demonstration which took place in Trenton on May 10 were processed by the software experts in Oakland University. They have collected some height data and recently generated a color map of tree heights. Actual data from the field need to be taken to compare the results.
- B. A meeting with NJDOT was held on June 11 where a new idea for data collection was proposed, which is the use of RC blimps instead of the RC helicopters. A comparison of the two methods was conducted and it was clearly shown that the blimp will face a major problem which is the mobilization and helium price. At the end, a green light was given for the RC helicopters.
- C. We made a last attempt to reconsider the use of LIDAR and laser technology by attending a presentation in Trenton (NJDOT) on Cyrax Technologies held by Leica Geosystems. The cost and ability to perform the scan on large areas remain the same major problems for this technology.
- D. The first step we took to start with the RC helicopter technology as data collection was the purchase of a new software called "RealFlight" which is an RC simulation for RC helicopters and planes. It is a pretty neat software which give us the real feeling and touch on how to fly the radio controlled crafts using the same radio control that we will use on the field.

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2. Proposed activities for next quarter by task

- A. Collect all the necessary accessories to build the RC helicopter desired to collect data/pictures (Cameras, GPS servos,...)
- B. Work on the prototype software which will the 3-D data collector from the digital pictures.
- C. Possibility of performing a second field demonstration to acquire better images along with some actual data and fixed reference points to check the accuracy of the software.

3. List of deliverables provided in this quarter by task (product date)

- A. Two radio controlled simulation software for RC helicopters.

4. Progress on Implementation and Training Activities

“RealFlight” software is an excellent basic training for flying the RC crafts. The second step is to hire a professional pilot that will give flying lessons for NJDOT personnel.

5. Problems/Proposed Solutions

- A. Ability of the NJDOT personnel to learn to fly an RC helicopter because it is considered a difficult task.
- B. In order to get the best data from the images, shot from the RC helicopter need to be taken at constant heights which might be difficult to perform.

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$210,000.00
Total Project Expenditure to date		\$33,824
% of Total Project Budget Expended		16%
Task Order Number/Study Number:		115 / 4-26857
Current Task Order Budget (# of years)	Year 1 and 2	\$210,000.00
Actual Expenditure to date against current task order		\$33,824
% of current task order budget expended		16%

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QUARTERLY PROGRESS REPORT

Project Title:	Modeling of Construction Doremus Avenue Bridge Structure		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: Nick Vitillo		
TASK ORDER NUMBER/Study Number: 99 / 4-26676	PRINCIPAL INVESTIGATOR: Hani Nassif		
Study Start Date: 01/01/2001 Study End Date: 12/31/2004	Period Covered: 3 rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search and Field Coordination	5%	0%	100%	5%
Finite Element Model Development and verification (Substructure & Superstructure)	10%	20%	90%	9%
Develop Instrumentation Plan and Install Sensors	20%	15%	95%	19%
Parametric Study	20%	10%	80%	16%
Perform Monitoring and Data Collection	25%	40%	60%	15%
Prepare Recommendations to Modify AASHTO and NJDOT's Procedures	5%	0%	0%	0%
Comparison of Analytical and Experimental Results	5%	30%	50%	2.5%
Progress Reports	5%	30%	90%	4.5%
Final Report	5%	0%	0%	0%
TOTAL	100%			71%

1. Progress this quarter by task

A. Sensor layout planning for Stage II.

1. Includes estimated cable lengths to be cut.
2. Sensors to be installed: (24) Strain Transducers on girders, (33) VWG in deck, (1) LVDT for girder deflection for Stage II.

B. Sensor Preparation for Stage II

1. Sister rebar epoxy coating
2. Testing of all sensors for operability
3. Cutting and coating of #3 rebar jigs for installation of VWG in bridge deck
4. Cable labeling for sub-contractor splicing

C. Sensor Installation for Stage II.

1. Installation in deck rebar
2. Wiring sensor channels into data logger
3. Strain Transducers: Partial installation, span 1 completed (7 sensors of 24 total)

D. Concrete Pouring. Four pours, one cancellation day (due to excessive concrete temperature)

1. Pour 1: Took samples for compressive strength and elastic modulus) and monitored deck vibration for a period of 1 hour after pouring complete.

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2. Pour 2: Took compressive strength to check consistency with pour 1 (f'c found to be consistent). The electrical subcontractor did not splice the deck sensors in time for pouring; therefore no deck strain data could be collected. Furthermore, no comprehensive testing was conducted post-pour.
 3. Pour 3: Cancelled due to excessive weather temperature.
 4. Pour 4: Contractor scheduled both Pour 3 and 4 on the same date. Took samples for compressive strength and Elastic Modulus. Vibration and WIM truck data were taken for one-hour intervals post-pour over a period of three hours.
- E. Crack cataloging and measurement
1. Stage I, measurement of location and extent for Unit 1.
 2. Stage II, similar measurements and extents taken for Pour 1, visual inspection for Pour 2 (no significant visual cracking found).
- F. WIM System
1. WIM system fully calibrated. Data was accurate for a period of 1 week when the system stopped responding. After consulting the manufacturer, we adjusted the sensitivity. An ongoing problem is that the system only collects data for 30 minutes every day. The manufacturer has been unhelpful up to this point.
- G. Fatigue System
1. Sensors installed and configured
 2. LVDT replacement installed. Previous LVDT rod assembly was missing from bridge (probably due to bird activity).
 3. Ongoing problems with remote telephone connection.
- H. Phone Router
1. Installed to connect with multiple systems with one phone line.
 2. On-Site Weather Sensor. (Humidity Sensor): Previously installed on scaffolding for Stage I. When the scaffolding was relocated for Stage II, the wires were severed. Reinstalled at Pier 2.
2. Proposed activities for next quarter by task
1. Strain Transducer and LVDT Installation
 2. Subcontractor splicing of STS and LVDT wires to Pier 2
 3. Crack monitoring (visual) of Spans 2 and 3.
 4. Static testing requiring traffic control.
 5. Dynamic testing also requiring traffic control.
 6. Portable WIM system problem solving.
 7. Solve telephone issues with Fatigue system
3. List of deliverables provided in this quarter by task (product date)
4. Progress on Implementation and Training Activities
5. Problems/Proposed Solutions

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6. Budget Summary*

Total Project Budget (# of years)	4 Years	\$467,682.00
Total Project Expenditure to date		\$158,017
% of Total Project Budget Expended		34%
Task Order Number/Study Number:		99 / 4-26676
Current Task Order Budget (# of years)	Year 1, 2, 3, and 4	\$467,682.00
Actual Expenditure to date against current task order		\$158,017
% of current task order budget expended		34%

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QUARTERLY PROGRESS REPORT

Project Title:	A Proposal for the Development of High Performances Concrete for Transportation Structures in New Jersey		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: Tony Chmiel		
TASK ORDER NUMBER/Study Number: 62 / 4-23806	PRINCIPAL INVESTIGATOR: Hani Nassif		
Study Start Date: 04/30/2001 Study End Date: 01/01/2003	Period Covered: 3 rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Selection of Final Mixes	5%	5%	100%	5%
Collection of Data and Preparation of Samples During the Field Samples	20%	10%	85%	17%
Evaluation of Field Samples	10%	20%	80%	8%
Creep and Shrinkage Set-up and Testing	50%	20%	90%	45%
Preparation of Specifications for HPC	10%	10%	20%	2%
Final Report	5%	10%	20%	1%
TOTAL	100%			78%

1. Progress this quarter by task:

A. Creep Set-up

- i) Mixes having a concrete strength of 6, 8, and 10 ksi are mixed using different combinations of fly ash and silica fume. Two sources of aggregates were used for the 10 ksi mix. The first type of aggregate was taken from Weldon while the second type was taken from Trap Rock.
- ii) Three types of sensors were used: 1) external vibrating wire strain gages, 2) embedded vibrating wire strain gages, and 3) foil gages. The reason for using three different types of gages was to minimize the cost of the test by comparing the accuracy of the low-cost foil gages in comparison to the more accurate but expensive VWSG's. The foil gages were not very reliable and there was a lot of discrepancy in the data. The embedded gages are also a good solution but they are not reusable and very difficult to install (i.e. we do not know whether the gages is perfectly aligned or tilted). The external gages were the best solution. Hence, currently only external vibrating wire strain gages are used (three gages are installed on each cylinder separated by 120 degree angles. All of the gages are connected to the data logger and data are collected every 10 minute for a period of 1 month and manually thereafter, collected at one month intervals for 1 year).
- iii) Currently we have 6 rigs loaded and 10 more rigs are in the process of being loaded. The rigs are performing very well. The applied load is kept constant with this creep rig setup.

B. Field mixes

- i) One field mix was sampled using American Concrete mixing plant in Newark, NJ. The mix uses slag and silica fume. There are not many mixing plants in New Jersey that have fly ash in a silo. The silica fume was added using increments of 25 lb bags rather an actual percentage due to similar limitations at the plant. Therefore, it is our plan to calibrate the developed mixes using the amount of silica fume in "bag" rather than by a percentage of total

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- weight of the cementitious material. This will make it easier for concrete producing plants to implement in future mix HPC.
- ii) The mix has high performance concrete characteristics and is designed within the NJDOT limit for HPC criteria. However, it took the concrete mixing plant three trials to get the specified slump. It is recommended that NJDOT allows Rutgers to collect concrete samples of ongoing construction projects where “HPC” mixes are being implemented.
- C. Scaling:
- Scaling tests were performed on all of the creep mixes. Overall the HPC samples show good scaling resistance. This test is a difficult test to do since it could not be automatized (the test involves a person taking the samples out of the freezer and let the sample thaw during the day and then places the sample back in the freezer to let the sample freeze at night for a period of 50 days, at every 5 days the sample is visually inspected for scaling) and it is also a subjective test. A more labor-free test method should be used to replace this test. It is recommended to use the Freeze-Thaw standard test with special modifications to replace this labor-intensive test.
- D. Autogenous shrinkage
- i) Autogenous (or early-age) shrinkage was measured using embedded vibrating wire strain gages.
 - ii) Both HPC and HSC mixes were evaluated under various curing methods as well as curing conditions.
- E. Freezing and Thawing
- i) Freezing and thawing tests were conducted on all of the creep mixes. We found no significant effect on freezing and thawing as long as the concrete is air entrained.
- F. Other tests
- i) For every new mix the following tests are also performed: 1) compressive strength, 2) elastic modulus, 3) rapid chloride permeability, and 4) drying shrinkage.
- 2. Future Tasks:**
- ii) Implement more mixes using concrete from ready mix concrete plants. If possible, sampling from an actual field pouring where HPC mix design is being utilized.
 - iii) Processing and continuing to collect creep data. The data from creep will be the basis for the development and verification of new and existing creep models, respectively.
 - i) Verification of SHRP equipment for measuring air permeability test (Task is supposed to be performed by Dr. Balaguru and his students).
 - ii) Develop and finalize a draft for the technical specifications in coordination with NJDOT staff and present recommendations for changes, if any, to current specifications.



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2. Proposed activities for next quarter by task

A. Continue the testing Tasks as follows:

I. Mix concrete for design strength 10000 psi.

II. Shrinkage

-Test the available samples at an age of 56 & 90 days.

III. Freeze & Thaw

-Test the samples placed in freeze & thaw apparatus every 5 days.

IV. Rapid Chloride Permeability

-Test samples of 6-III at an age of 28 days and samples of 6I, 6II, 6III & 8I at an age of 56 & 90 days.

B. Check Autogenous (immediate) shrinkage for each mix in addition to the drying shrinkage.

C. Arrange for field mixing day with Clayton Concrete batching plant.

3. List of deliverables provided in this quarter by task (product date)

N/A

4. Progress on Implementation and Training Activities

N/A

5. Problems/Proposed Solutions

N/A

6. Budget Summary*

Total Project Budget (# of years)	1.5 Years	\$384,320.00
Total Project Expenditure to date		\$283,145
% of Total Project Budget Expended		74%
Task Order Number/Study Number:		62 / 4-23806
Current Task Order Budget (# of years)	Year 1.5	\$384,320.00
Actual Expenditure to date against current task order		\$283,145
% of current task order budget expended		74%

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QUARTERLY PROGRESS REPORT

Project Title:	Evaluation Study of the NJ Turnpike Authority's Value Pricing Initiative		
RFP NUMBER:		NJDOT RESEARCH PROJECT MANAGER: Nancy Ciaruffoli	
TASK ORDER NUMBER/Study Number: 114 / 4-26xxx		PRINCIPAL INVESTIGATOR: Kaan Ozbay	
Study Start Date: 01/01/2002 Study End Date: 12/31/2002		Period Covered: 3 rd Quarter 2002	

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search	10%	0%	0%	0%
Final Report	10%	0%	0%	0%
TOTAL	100%			0%

1. Progress this quarter by task:

We finalized the budget, submitted to NJDOT and it has been accepted by NJDOT. We obtained the letter of support from NJTPA (similar to the original letter obtained from Ed Gross) requested by NJDOT before finalizing the contractual agreements between Rutgers University and NJDOT. NNJTPA letter support was received by NJDOT and now we are waiting for the fully executed Task Order.

We started to look at the various value pricing projects and theory behind them.

2. Proposed activities for next quarter by task

Obtain information about previous studies concerning New Jersey Turnpike
Determine the modeling and data needs.

3. List of deliverables provided in this quarter by task (product date)

4. Progress on Implementation and Training Activities

5. Problems/Proposed Solutions

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We have to get the final task order from NJDOT in order to start the work.

6. Budget Summary*

Total Project Budget(# of years)	1 Year	\$ 530,468.00
Total Project Expenditure to date		No Data
% of Total Project Budget Expended		0%
Task Order Number/Study Number:		114 / 4-26xxx
Current Task Order Budget (# of years)	Year 1	\$ 530,468.00
Actual Expenditure to date against current task order		No Data
% of current task order budget expended		0%

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QUARTERLY PROGRESS REPORT

Project Title:	Life Cycle Cost Analysis		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: Richard Weed		
TASK ORDER NUMBER/Study Number: 91 / 4-23942	PRINCIPAL INVESTIGATOR: Kaan Ozbay & Neville Parker		
Study Start Date: 06/09/2000 Study End Date: 12/31/2002	Period Covered: 3 rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
First Year				
1. Review of Existing LCCA Procedures in NJDOT and other DOTs	30%	40%	100%	30%
2. Study of the LCCA Input Parameters from both Economics and Engineering Perspectives	30%	20%	1000%	30%
3. Preliminary Documentation of the LCCA Process	20%	20%	100%	20%
4. Workshop on the LCCA Process	10%	50%	50%	5%
5. Interim Report	10%	10%	100%	10%
TOTAL (First Year)	100%			85%
Second Year				
6. Development of Preliminary LCCA Guidelines	40%	10%	70%	28%
7. Development of Illustrative Case Studies	30%	20%	70%	21%
8. Guidelines and Case Study Workshop	10%			
9. Finalization of LCCA Guidelines	10%	30%	60%	6%
10. Final Report	10%	20%	20%	2%
TOTAL (Second Year)	100%	20%	20%	57%

Note: Tasks are based on the revised proposal submitted on

1. Progress this quarter by task:

- Task 4: Per Mr. Weed's suggestions, we decided to postpone this first and second workshops until a general guidelines report is agreed upon by him and us.
- Task 5: An interim report is completed and reviewed by Dick Weed. We met with him to discuss the interim report and the outline of the final report.
- Task 6: We have developed spread sheets for real examples for the development of guidelines in terms of the existing state-of-the practice. We are working on a paper that analyzes the LCCA method proposed in Cady's paper..
- Task 7: We are currently working with pavement management systems. However, the cost data is not readily available and now we are working at the NY State DOT database for possible use for Task 4. We are also working on an ITS example since ITS is radically different than pavement.
- Task 9: We submitted a paper to TRB that describes LCCA methods.

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Task 10: We are working on the final report.

2. Proposed activities for next quarter by task

- Continue working on Task 6, 7, 9, 10.

3. List of deliverables provided in this quarter by task (product date)

4. Progress on Implementation and Training Activities

5. Problems/Proposed Solutions

- The workshops will be held after the approval of our outline by Dick Weed. This will enable us to catch up with Tasks 4 and 8.
- A no cost extension was requested due to the extra time required to complete the final report and workshops.
- It is difficult to get real world data. We are trying to contact other DOT's to see if we can get accurate data. We are specifically focusing on NY State and Washington State.
- We met with Dick Weed to discuss the overall scientific process to be followed and agreed upon the steps suggested by him. We also agreed to use long-life pavement as the application example without and major need for major changes to the project. Finally, we agreed to address the issue of "pay schedules" in the future as part of a separate possibly continuation project and we will be preparing a proposal for this purpose. .

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$204,495.00
Total Project Expenditure to date		\$130,684
% of Total Project Budget Expended		64%
Task Order Number/Study Number:		91 / 4-23942
Current Task Order Budget (# of years)	Year 1 and 2	\$204,495.00
Actual Expenditure to date against current task order		\$130,684
% of current task order budget expended		64%

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QUARTERLY PROGRESS REPORT

Project Title:	South-Jersey Real-Time Motorist Information System		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: Don Borowski		
TASK ORDER NUMBER/Study Number: 90 / 4-23924	PRINCIPAL INVESTIGATOR: Kaan Ozbay		
Study Start Date: 05/16/2000 Study End Date: 12/31/2002	Period Covered: 3 rd Quarter 2002		

Phase 1

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
1. Design of Communication and Surveillance System	50%	10%	100%	50%
2. Deployment of the System	25%	320%	100%	25%
3. Develop real-time information algorithms	5%	20%	100%	5%
4. Disseminate Traveler Information	3%	80%	100%	3%
5. Evaluate Effectiveness of the System	3%	30%	100%	3%
6. Develop Travel Time Estimation Model	12%	30%	100%	12%
7. Project Management	2%	30%	100%	2%
Final Report				
TOTAL	100%			100%

Note: Part of Task 3 and Tasks 4 and 5 will be performed during the second year of this project.

Phase 2

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
1. Determination of optimal number and location of the traffic sensors	30%	70%	70%	21%
2. Determination of optimal locations and number of Variable Message Signs (VMS)	30%	500%	50%	15%
3. Assessment and implementation of software / hardware changes	30%	10%	10%	3%
4. Project Management and Final Report	10%	0%	0%	0%
TOTAL	100%			39%

1. Progress this quarter by task:

- Draft final report for Phase 1 is finalized and reviewed. It has been accepted.

Phase 2

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- Task 1: Simulation for the corridor was customized and multiple runs were performed to determine optimal number of sensors.
- Task 2: Multiple runs were performed to determine optimal location and number of VMS signs.

2. Proposed activities for next quarter by task

Phase 1 of this project is completed.

Phase 2 for this project has been proposed to NJDOT and accepted by NJDOT. The work started. We are in the process of discussing with L-3 an extension to their contract.

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3. List of deliverables provided in this quarter by task (product date)

- Final report is delivered to NJOT, it has been reviewed and accepted by NJDOT.

4. Progress on Implementation and Training Activities

5. Problems/Proposed Solutions

- A budget revision is obtained to finalize this project.

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6. Budget Summary*

Total Project Budget(# of years)	1.5 Years	\$318,242.00
Total Project Expenditure to date		\$282,141
% of Total Project Budget Expended		89%
Task Order Number/Study Number:		90 / 4-23924
Current Task Order Budget (# of years)	Year 1.5	\$318,242.00
Actual Expenditure to date against current task order		\$282,141
% of current task order budget expended		89%

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QUARTERLY PROGRESS REPORT

Project Title:	Development of a Simulation Model of an ITS Priority Corridor		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: Karl Brodtman		
TASK ORDER NUMBER/Study Number: 88-01 / 4-23935	PRINCIPAL INVESTIGATOR: Kaan Ozbay		
Study Start Date: 06/01/2000 Study End Date: 12/31/2002	Period Covered: 3 rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
First Year				
1. Literature Review	20%	25%	100%	20%
2. Simulation Model Development	80%	10%	100%	80%
Total (Year 1)	100%			100%
Second Year				
3. Calibration and Validation	40%	70%	100%	40%
4. ITS Scenario Evaluation	50%	30%	70%	35%
5. Final Report	10%	30%	40%	4%
TOTAL	100%			79%

Note: Part of Task 3 and Tasks 4 and 5 will be performed during the second year of this project.

1. Progress this quarter by task:

Tasks 1, 2, 3:

- We completed these tasks.

Task 4:

- We developed a set of scenarios based on our meeting with Paul Truban of NJDOT and Peter Kremer of PB (consultant to NJDOT) to discuss recent ITS planning project they are doing in South Jersey.
- There are three scenarios namely, ramp metering alone, VMS alone, and ramp metering and VMS combined. We ran the first two scenarios and obtained results.

Task 4: Started writing the final report.

2. Proposed activities for next quarter by task

- Task 4: Finalize the comparison of identified major scenarios and before and after tests.
- Task 5: Finalize the final report.

3. List of deliverables provided in this quarter by task (product date)

4. Progress on Implementation and Training Activities

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5. Problems/Proposed Solutions

We had to go back to Task 3 (Calibration and Validation) to solve some of new problems encountered as a result some inconsistencies observed during Task 4. We fixed this problem by improving the calibration process.

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$81,795.00
Total Project Expenditure to date		\$59,499
% of Total Project Budget Expended		73%
Task Order Number/Study Number:		88-01 / 4-23935
Current Task Order Budget (# of years)	Year 1 and 2	\$81,795.00
Actual Expenditure to date against current task order		\$59,499
% of current task order budget expended		73%

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QUARTERLY PROGRESS REPORT

Project Title:	Evaluation of Incident Management Strategies		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: Karl Brodtman		
TASK ORDER NUMBER/Study Number: 88-02 / 4-23934	PRINCIPAL INVESTIGATOR: Kaan Ozbay		
Study Start Date: 06/01/2000 Study End Date: 12/31/2002	Period Covered: 3 rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
First Year				
1. Review of Existing Incident management Strategies in US / NJ	20%	40%	100%	20%
2. Data Collection and Analysis	50%	10%	100%	50%
3. Determine Measures of Performance	10%	60%	100%	10%
4. Quantify MOP's Using NJ Data	20%	35%	100%	20%
Total (First Year)	100%			100%
Second Year				
5. Simulation Framework	80%	20%	90%	81%
6. B/C Analysis for Candidate Incident Management Strategies	20%	30%	70%	14%
Total (Second Year)	100%			95%
Final Report				

Note:

1. Part of Tasks 3 and Tasks 4 will be performed during the second year of this project.
2. We have added tasks for second year.
3. We have also added sub-totals for years 1 and 2.

Progress this quarter by task:

- Task 1: This task is complete.
- Task2: This task is complete.
- Task 3: This task is complete.
- Task 4: This task is complete.
- Task 5: We have already developed a simulation framework and a prototype simulation program. The program is used to simulate different IM strategies on the South Jersey network. We integrated the traffic simulation with IM simulation. We have done test runs. We have also worked with incident real data to develop statistical incident generation functions to be used in conjunction with simulation. Multiple simulation runs are being conducted to test different IM scenarios in terms of resources, strategies, and incident and network-wide traffic characteristics.
- Task 6: We are using the already collected data and information on the IM technologies such as, their cost, and their impact on IM operations. Now, we are in the process of quantifying impacts of incidents and incident management strategies on the congestion.

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2. Proposed activities for next quarter by task

- Task 5: Finalize this task
- Task 6: Finalize analysis of scenarios for B/C analysis.
- Complete final report

3. List of deliverables provided in this quarter by task (product date)

4. Progress on Implementation and Training Activities

5. Problems/Proposed Solutions

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$68,349.00
Total Project Expenditure to date		\$66,911
% of Total Project Budget Expended		98%
Task Order Number/Study Number:		88-02 4-23934
Current Task Order Budget (# of years)	Year 1 and 2	\$68,349.00
Actual Expenditure to date against current task order		\$66,911
% of current task order budget expended		98%

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QUARTERLY PROGRESS REPORT

Project Title:	Evaluation of Adaptive Control Strategies for NJ Highways		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: Karl Brodtman		
TASK ORDER NUMBER/Study Number: 101 / 4-26682	PRINCIPAL INVESTIGATOR: Kaan Ozbay		
Study Start Date: 01/01/2001 Study End Date: 12/31/2003	Period Covered: 3 rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Task 1: Literature Survey	10%	30%	100%	10%
Task 2: Inventory Assessment	25%	20%	100%	25%
Task 3: Site Selection	5%	0%	100%	5%
Task 4: DSS Development	30%	20%	55%	15.5%
Task 5: Gap Analysis	5%	80%	100%	5%
Task 6: Implementation Strategies	5%			
Task 7: Training	5%			
Progress Reports				
Final Report				
TOTAL	100%			60.5%

1. Progress this quarter by task:

Task1: This task is complete.

Tasks 2 and 3: We have completed these tasks for the sites given to us by NJDOT. .

Task 4:

- We are writing the document for the GIS GUI for DSS. Now, the DSS is completely operational. It is implemented using Geomedia Pro and has full functionality in terms of database connection and its linkage with SYNCHRO.
- We have also completed the programming of ARENA based simulation model and its comparison with Paramics. We have modified it for multiple intersections. Now, we have implemented Route 18 network in this program. We are working on a draft "working paper".
- We have also programmed SCATS adaptive signal control strategy for individual intersections. We are in the process of testing it for already modeled intersections (Routes 10 and 18). We are also in contact with SCATS and Paramics which have developed a real implementation of SCATS for Parmaics and we are trying to obtain this beta version.
- We have been working our own version of SCOOT, since it was not possible to integrate REALTRAN developed by Professor Hesham Rakha of Virginia Tech with Paramics.
- We purchased an hardware interface between CORSIM and traffic controllers and we are in the process of developing hardware in the loop experiment with the controller we obtained from Traficon. Then we will try to use an OPAC based controller obtained from NJDOT to do hardware-in-the-loop study using and interface between the controller and CORSIM. However, this type of hardware-in-the-loop simulation needs additional work and software we are in the process of exploiting this.

Task 5: The information we received in Tasks 2 and 3 are used to develop this "gap analysis".

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2. Proposed activities for next quarter by task

Task 3: Finalize and document the software portion of the DSS.

Task 4: Continue the work on implementing SCATS, SCOOT, and OPAC. Work on the implementation of the expert system.

3. List of deliverables provided in this quarter by task (product date)

4. Progress on Implementation and Training Activities

5. Problems/Proposed Solutions

- There is a considerable delay between the official starting date of the project and the actual starting date, date when the account is set-up and students can be hired. This time lag also affects the availability of students. Now we have all the student we need, however, the time lag can cause some delay at the end of the project.
- It is becoming clear that the adaptive signal strategies such as SCOOT and SCATS are not readily available for us to implement in Paramics. This considerably slows down our progress since we have to build algorithms similar to these and then program them. We are waiting for SCOOT to give us the beta version of their control algorithm.
- We have also introduced hardware-in-the-loop concept for the OPAC type controllers since this seems to be the best way to simulate these.
- Delay in having these algorithms implemented delays the whole project, especially the DSS part.

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$318,458.00
Total Project Expenditure to date		\$106,305
% of Total Project Budget Expended		33%
Task Order Number/Study Number:		101 / 4-26682
Current Task Order Budget (# of years)	Year 1 and 2	\$318,458.00
Actual Expenditure to date against current task order		\$106,305
% of current task order budget expended		33%

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QUARTERLY PROGRESS REPORT

Project Title:	Development and Evaluation of Geotechnical Design Parameters Using the Seismic Piezocone		
RFP NUMBER:			NJDOT RESEARCH PROJECT MANAGER: Mr. Anthony Chmiel
TASK ORDER NUMBER/Study Number: 88-04 / 4-23932	PRINCIPAL INVESTIGATOR: Dr. Ali Maher		
Study Start Date: 06/01/2000 Study End Date: 9/30/2001	Period Covered: 3rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search	10%	100%	100%	10%
1. Field Testing	40%	5%	100%	40%
2. Laboratory Testing	20%	5%	100%	20%
3. Calibration	10%	5%	100%	10%
4. Reporting	20%	30%	100%	20%
Final Report				
TOTAL	100%			100%

1. Progress this quarter by task:

The draft copy of the report has been finished and will be given to the NJDOT for review. Based on the comments, revisions will be made and a final report submitted.

2. Proposed activities for next quarter by task:

A. Finish revisions of final report.

3. List of deliverables provided in this quarter by task (product date)

N.A.

4. Progress on Implementation and Training Activities

N.A.

5. Problems/Proposed Solutions

N.A.

6. Budget Summary*

Total Project Budget(# of years)	1 Year	\$30,000.00
Total Project Expenditure to date		\$29,966
% of Total Project Budget Expended		100%
Task Order Number/Study Number:	88-04 / 4-23932	
Current Task Order Budget (# of years)	Year 1	\$30,000.00
Actual Expenditure to date against current task order		\$29,966
% of current task order budget expended		100%

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QUARTERLY PROGRESS REPORT

Project Title:	Rut Testing of Hot Mix Asphalt		
RFP NUMBER:	NJDOT RESEARCH PROJECT MANAGER: Mr. Nicholas Vitillo		
TASK ORDER NUMBER/Study Number: Task Order No. 98 / 4-26677	PRINCIPAL INVESTIGATOR: Dr. Ali Maher		
Study Start Date: 01/01/2001 Study End Date: 12/31/2002	Period Covered: 3rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search/Local Agency Survey	10%	25%	100%	10%
Lab Testing for Rutting Criteria	25%	20%	100%	25%
Lab Testing for NJ HMA Characterization	25%	10%	20%	5%
Lab Testing for SUPERPAVE vs Marshall	20%	10%	35%	7%
Field Calibration/Evaluation	10%	0%	0%	0%
Final Report	10%	0%	0%	0%
TOTAL	100%			47%

1. Progress this quarter by task:

- A. Repeated Shear at Constant Height (RSCH) tests on identical samples to the APA testing were and are being conducted. The tests will be conducted at both 52 degrees C and 64 degrees C. Although the APA test temperature is 64 C, results from the Modified Binder study show that there is a strong correlation between RSCH at 52 C and APA rutting tests at 64 C. The RSCH results will be used in an attempt to develop another method to determine if HMA mixes are rut susceptible.
- B. The APA testing has completed for the Rut Criteria. A total of 12 different mixes were evaluated. The mixes varied in gradation (above and below the restricted zone), binder type (PG64-22, PG70-22, and PG76-22), and also design traffic level (very heavy, heavy, and medium). The PG70-22 and PG76-22 were only used in the very heavy traffic levels. All samples were compacted to 7% (+/- 0.5%) air voids and tested at 64 degrees C. The samples were heated for 4 hours at 64 degrees C prior to testing and evaluated at 8,000 cycles. This conforms to typical testing protocols used throughout the United States. Based on the results, the following APA Rut Criteria was developed based on traffic levels; 1) Very Heavy traffic – 3mm of APA rutting, 2) Heavy traffic – 5 mm of APA rutting, and 3) Medium traffic – 8 mm of APA rutting. These results were found to be very similar to the current criteria of the Arkansas DOT and the Oklahoma DOT. It should be emphasized that this criteria was solely based on gyratory-laboratory prepared samples. Using cores from the field may not be suitable within this criteria. This criteria is best used as a performance-type test after a volumetric mix design has been conducted.
- C. Permeability testing was conducted on identical samples. The falling head permeability results show a strong correlation with the APA rutting, where as the permeability of the gyratory samples increases, so does the rutting. The R^2 value of the correlation was determined to be 0.79. This essentially shows that the NJDOT low volume roads may be highly susceptible to water infiltration. Continued evaluation of this relationship will be attempted in future work.
- D. Results from CoreLok and T166 air void comparisons show that the CoreLok consistently provides a higher air void content then the T166 method. Strong correlations were developed when evaluating the fine and coarse mixes separately, $R^2 = 0.83$ and 0.84 , respectively. As with the permeability results, this type of evaluation will continue to be developed.

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- E. Aggregates are being collected to produce samples for field comparison. The procedure for the development of samples for the Low Volume Road analysis will be as follows:
1. After all aggregates are collected, samples will be prepared in the gyratory compactor based on the job mix formula. These samples will essentially be Marshall design samples, however, compacted in the gyratory compactor. Enough samples will be made to conduct permeability, APA rutting, and Indirect Tensile Strength.
 2. After the Marshall design samples have been completed, the gradations provided from the job mix formulas will be used to develop a mix design under the Superpave design method. The samples will be evaluated for an N_{design} of 75. Again, enough samples will be made to conduct permeability, APA rutting, and Indirect Tensile Strength testing.
 3. Once the actual Superpave design has been finished, a second design will be conducted, however, the N_{design} will be based on the Low Volume data collected from producers in the NJ. Based on 4 different I-5 mixes, it was estimated that an $N_{\text{design}} = 50$ would provide the same compaction necessary to simulate a Marshall design. Enough samples will again be made to conduct similar performance-type testing. After evaluation of this design will determine if more samples must be constructed using either more or less gyrations.

2. Proposed activities for next quarter by task:

- A. RSCH tests for the Rutting Criteria will be tested. A correlation will be made between the results of the RSCH and the APA. Based on the correlation and the APA criteria, a rutting criteria based on the RSCH test will be proposed.
- B. Construction of the Low Volume Road samples will begin. Based on the progress in the laboratory and sample collection, both the Marshall and initial Superpave designs will be done.

3. List of deliverables provided in this quarter by task (product date):

N/A

4. Progress on Implementation and Training Activities:

N/A

5. Problems/Proposed Solutions:

N/A

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$321,867.00
Total Project Expenditure to date		\$119,287
% of Total Project Budget Expended		37%
Task Order Number/Study Number:		98 / 4-26677
Current Task Order Budget (# of years)	Year 1 and 2	\$321,867.00
Actual Expenditure to date against current task order		\$119,287
% of current task order budget expended		37%

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QUARTERLY PROGRESS REPORT

Project Title:	The Development of a Performance Specification for Granular Base and Subbase Material		
RFP NUMBER:	NJDOT RESEARCH PROJECT MANAGER: Mr. Anthony Chmiel		
TASK ORDER NUMBER/Study Number: Task Order No. 83 / 4-23914	PRINCIPAL INVESTIGATOR: Dr. Ali Maher		
Study Start Date: 03/01/2000 Study End Date: 08/31/2003	Period Covered: 3rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search	5%	25%	100%	5%
1. Material Collection	5%	40%	100%	5%
2. Laboratory Testing	60%	5%	55%	33%
3. Calibration	10%	10%	30%	3%
4. Reporting	20%	10%	10%	2%
Final Report				
TOTAL	100%			47%

1. Progress this quarter by task:

- A. Both falling head and constant head permeability tests were completed. A comparison of results show that the values from the two tests are within 10% of one another, except for the high end (very coarse) gradations. This is most likely due to high hydraulic gradients that occur during the falling head tests. The constant head tests are required to be within a range of hydraulic gradients to ensure that Darcy's Law holds. However, there are no hydraulic gradient constraints with the falling head test. Therefore, based on the testing, the falling head test can easily be modified to be conducted in the field and can be used as an on-site quality control performance test for most materials. The falling head test, however, is not recommended for the coarser, open-graded aggregates. These materials should be tested under laboratory conditions.
- B. A statistical analysis was conducted to determine if an empirical equation could be developed to estimate the permeability of the aggregates based on density and gradation information. The best correlations seems to occur when both void ratio and D10 were used. These type of analysis will continue to be developed until the final report is finished.
- C. Static triaxial testing began, however, results were not yet available for this progress report.

2. Proposed activities for next quarter by task:

- A. Static triaxial testing of the I-3 will continue. If no problems occur, resilient modulus testing should follow soon behind the triaxial testing.
- B. Continue the collection RAP and RCA for evaluation. The materials will be evaluated for grain size, compaction, and permeability characteristics.

3. List of deliverables provided in this quarter by task (product date)

N.A.

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4. Progress on Implementation and Training Activities

N.A.

5. Problems/Proposed Solutions

N.A.

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$286,041.00
Total Project Expenditure to date		\$212,912
% of Total Project Budget Expended		74%
Task Order Number/Study Number:		83 / 4-23914
Current Task Order Budget (# of years)	Year 1 and 2	\$286,041.00
Actual Expenditure to date against current task order		\$212,912
% of current task order budget expended		74%

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QUARTERLY PROGRESS REPORT

Project Title:	Investigation into Modified Asphalt Binders for Improved Pavement Performance		
RFP NUMBER:	NJDOT RESEARCH PROJECT MANAGER: Mr. Anthony Chmiel		
TASK ORDER NUMBER/Study Number: Task Order No. 80 / 4-23908	PRINCIPAL INVESTIGATOR: Dr. Ali Maher		
Study Start Date: 02/01/2000 Study End Date: 01/31/2003	Period Covered: 3rd Quarter 2002		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search	10%	50%	100%	10%
1. Material Collection	5%	25%	100%	5%
2. Laboratory Testing	50%	20%	80%	40%
3. Calibration	15%	25%	50%	7.5%
4. Reporting	20%	25%	25%	5%
Final Report				
TOTAL	100%			67.5%

1. Progress this quarter by task:

- A. The remainder of duplicate samples was completed for both the Frequency Sweep and Repeated Shear at Constant Height. Results of the Frequency Sweep rank the tested materials in the following order: 1) Koch Materials PG76-22, 2) Citgo PG76-22, 3) Creanova Vestoplast additive, 4) Eastman EE2 additive, 5) Hydrocarbon Technologies Carbon Black additive, and 6) Citgo PG64-22. The ranking was based on the dynamic shear modulus at high, medium, and slow loading speeds. The Koch 76-22 and Citgo 76-22 actually tied based on these results, however, the Koch 76-22 obtained higher dynamic shear modulus values at the slower loading speeds at all temperatures. This was found to be an added benefit and therefore made the Koch 76-22 rank higher. The materials were also ranked based on the recoverable dynamic shear modulus and were identical to the previous ranking, except that the Citgo PG64-22 ranked 5th and the Hydrocarbon Technologies Carbon Black additive ranked 6th.
- B. The ranking for the Repeated Shear at Constant Height test results were evaluated at both 52 and 64 degrees C. The ranking was based on the accumulated permanent shear strain at both 3,000 and 5,000 cycles. Obviously, the samples that developed the least amount of permanent shear strain ranked the best. The ranking for the Repeated Shear at Constant Height were as follows: 1) Koch Materials PG76-22, 2) Citgo PG76-22, 3) Creanova Vestoplast additive, 4) Eastman EE2 additive, 5) Citgo PG64-22, and 6) Hydrocarbon Technologies Carbon Black additive. Based on the Repeated Shear data, the Eastman EE2 material does not seem to be as temperature sensitive as the other materials since it obtained very similar permanent shear strains for the 52 and 64 degree C test temperatures.
- C. Attempts were made to conduct Simple Shear at Constant Height tests at 4 degree C, to accompany the other test temperatures, however, due to unusually hot weather, the environmental chamber had difficulties stabilizing temperatures below 10 degrees C. Therefore, the Simple Shear tests and the Creep Compliance testing was postponed until the weather cooled. If problems persist, the 4 degree C test temperature will not be included in the test. The cooling problem should not occur for the Creep Compliance test since the SST chamber is "piggy-backing" off of the IDT chamber. The IDT chamber is where the Creep Compliance testing will be conducted.

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2. Proposed activities for next quarter by task:

- A. The SST will be used in the Simple Shear at Constant Height (SSCH) mode. This test is an evaluation of the creep performance of the material at different temperatures. Tests will be conducted at the same temperatures (20, 40, and 52°C) as were the FSCH and RSCH tests, as well as the 4 degrees C.
- B. Creep compliance testing will also be conducted using the IDT system. The creep testing will be tested at (-10, 2, and 20°C). These temperatures were modified from the original set of -10, 0, and 10 degrees C so a better comparison of creep properties can be made to the Simple Shear at Constant Height test. Currently, new test fixtures are being built at James Cox and Sons, Inc. for the creep compliance testing. These fixtures were recommended by a research engineer from NCAT. Therefore, the amount of creep testing will be indicative of when the fixtures come for the manufacturer.

3. List of deliverables provided in this quarter by task (product date)

N.A.

4. Progress on Implementation and Training Activities

N.A.

5. Problems/Proposed Solutions

N.A.

6. Budget Summary*

Total Project Budget(# of years)	3 Years	\$213,544.00
Total Project Expenditure to date		\$181,717
% of Total Project Budget Expended		85%
Task Order Number/Study Number:		80 / 4-23908
Current Task Order Budget (# of years)	Years 1, 2, and 3	\$213,544.00
Actual Expenditure to date against current task order		\$181,717
% of current task order budget expended		85%

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QUARTERLY PROGRESS REPORT

Project Title:	Evaluation and Improvement of Corrosion Inhibitors		
RFP NUMBER:		NJDOT RESEARCH PROJECT MANAGER: Carey Younger	
TASK ORDER NUMBER/Study Number: 93 / 4-23939		PRINCIPAL INVESTIGATOR: P. Balaguru	
Study Start Date: 06/14/2000 Study End Date: 06/14/2002		Period Covered: 3 rd Quarter 2002	

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search				
1. Field Evaluation	60%	90%	100%	60%
2. Correlation of Laboratory and Field Data	30%	90%	100%	30%
3.				
4.				
Final Report	10%	50%	50%	5%
TOTAL	100%			95%

1. Progress this quarter by task:

Readings were taken for the lab samples.

2. Proposed activities for next quarter by task

Continue to take readings for the mini decks in the laboratory and bridges in Rt 133.

3. List of deliverables provided in this quarter by task (product date)

N/A

4. Progress on Implementation and Training Activities

N/A

5. Problems/Proposed Solutions

N/A

6. Budget Summary*

Total Project Budget(# of years)	2 Years	\$32,901.00
Total Project Expenditure to date		\$32,901
% of Total Project Budget Expended		100%
Task Order Number/Study Number:		93 / 4-23939
Current Task Order Budget (# of years)	Year 1 and 2	\$32,901.00
Actual Expenditure to date against current task order		\$32,901
% of current task order budget expended		100%

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